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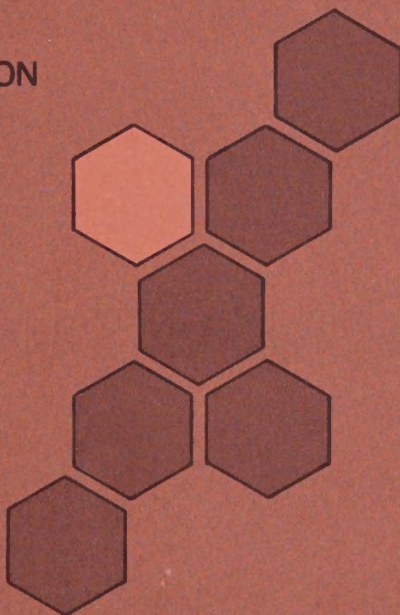
RESOURCES AND PRODUCTION PRACTICES IN THE ROLLING PLAINS

Don E. Ethridge, Dale L. Shaw
and W. C. McArthur

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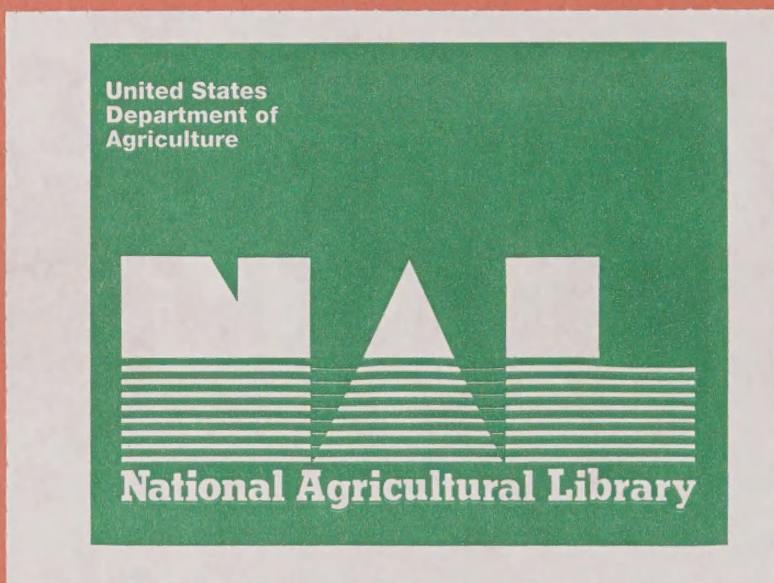
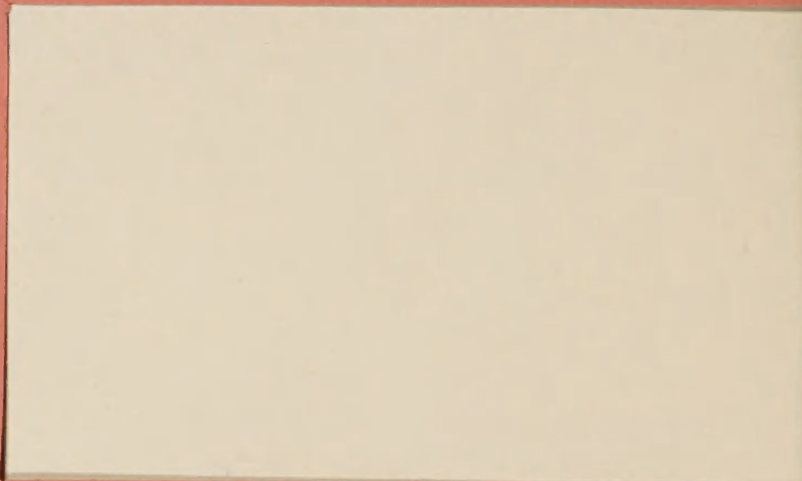
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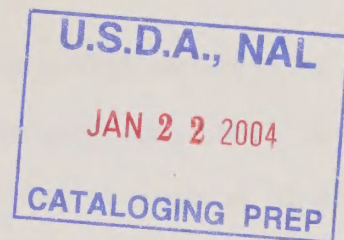
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RESOURCES AND PRODUCTION PRACTICES
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RESOURCES AND PRODUCTION PRACTICES IN THE ROLLING PLAINS

Don E. Ethridge, Dale L. Shaw and W. C. McArthur^{1/}

The Rolling Plains, encompassing 20 counties in Oklahoma and 40 counties in Texas, is an important agricultural area. Principally dryland farming, the area contains a variety of farm enterprises ranging from cash crops to cattle grazing. Wide differences characterize the resources and production possibilities in the area.

Land Resources

The Rolling Plains area contains more than 31.9 million acres of agricultural land with about 11.2 million acres in cropland. Much of the land is in native pasture and unsuitable for cultivation because of soil type and/or topography. A significant portion of the cropland is used for either forage or hay crops in any given year. The livestock industry is the major force in the regions's economy. Other farm activities are somewhat secondary to livestock. Wheat is the predominant crop in the region followed by cotton and grain sorghum. Other crops are alfalfa, peanuts, other grains, and a few soybeans; tree crops, vegetables and dairy are insignificant or non-existent. Wheat is a complimentary enterprise to livestock. It provides winter grazing for stocker cattle but is not widely used for cow-calf feeding. Cow-calf operations rely mostly on native pastures. Of the land suitable for cropping, 80 percent or more is already in cultivation. Non-irrigated farmland sells for \$200 to \$800 per acre, depending on its location, topography, soils, and so forth.

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Production Areas and Land Use

The Rolling Plains is divided into two production areas: Northern and Southern. Each area is further divided into sub-areas A and B (figure 1). Unlike the production areas of the High Plains, these area delineations were based on cropping patterns and yields rather than water or irrigation conditions. Irrigation is only a minor activity in the Rolling Plains. The north/south division is based largely on cotton yields with the southern part having higher yields than the northern. The subdivision is based largely on the proportion of cropland devoted to cotton, with the A sub-areas having a significantly larger proportion of cropland devoted to cotton (table 1). The harvested cotton acreage as a percent of total harvested cropland in 1974 amounted to 24 percent in Northern A, six in Northern B, 49 percent in Southern A, and eight percent in Southern B. This averaged out to 33 percent for the A subdivision and six percent for the B subdivision.

Cropping patterns are somewhat distinct among the four sub-areas; the same mix of crops tends to be grown in all areas, but the proportions are quite different (appendix tables 1-4). Cotton tends to decrease in importance as one moves from west to east and from south to north across the Rolling Plains. Grains tend to increase in importance with the same movement. Alfalfa occupies a small proportion of the acreage, but increases in importance as one moves northward. Grain crops harvested as forage or hay increase from west to east. Wheat and grain sorghum are the major grain crops, and wheat (grain sorghum) increases (decreases) in importance from south to north and west to east.

ROLLING PLAINS AREA

TEXAS-OKLAHOMA

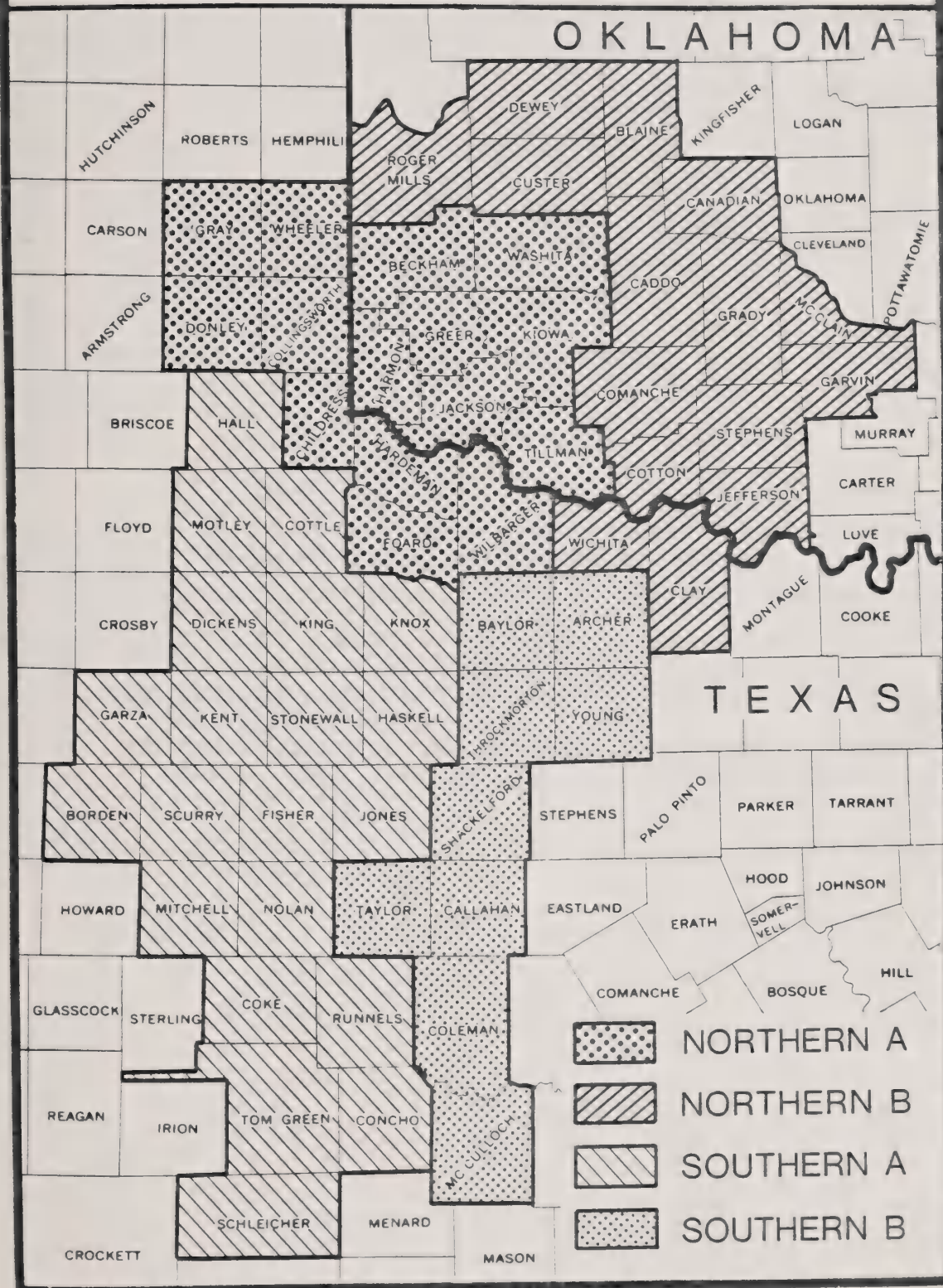


Figure 1.

Table 1. Cropland utilization in the Rolling Plains areas, 1974

Crop	Cropland harvested				
	Northern area		Southern area		Total
	A	B	A	B	all areas
	----- 1,000 acres -----				
Cotton	646.9	129.4	724.3	50.4	1,551.0
Alfalfa	103.3	159.0	10.4	.3	273.0
Grains	1,790.0	1,711.1	585.4	414.2	4,500.7
(Sorghum)	(159.6)	(84.3)	(310.8)	(72.0)	(626.7)
(Wheat)	(1,585.6)	(1,516.0)	(249.7)	(319.7)	(3,671.0)
Vegetables	.6	.8	2.3	.2	3.9
Other	154.5	260.9	169.0	197.4	781.8
Total	2,695.3	2,261.2	1,491.4	652.5	7,110.4

- Sources: (1) Oklahoma Crop and Livestock Reporting Service. Oklahoma County Statistics, 1974.
- (2) Texas Crop and Livestock Reporting Service. 1974 Texas County Statistics.
- (3) Texas Water Development Board. Inventories of Irrigation in Texas: 1958, 1964, 1969, and 1974, Research Report 196.

Cotton Yields

Cotton yields typically range from 200 to 300 pounds of lint per acre, but are quite variable from year to year and among subareas in the Rolling Plains. Median yields for the period 1966-74 amounted to 269 pounds in the Northern area and 294 in the Southern area (appendix tables 5-6). The data in these tables also show an upward trend in yields for both areas. For example, the average yield in the Southern Rolling plains for the period 1947-56 amounted to 142 pounds per acre compared with 296 pounds for 1965-74. A similar increase also occurred in the Northern Rolling Plains during these years.

Topography, Soils and Climate

Topography in the Rolling Plains is generally rolling, but varies from steep hills and gullies with rocky outcroppings to relatively flat terrain. Cropland is generally located in the flat or moderately rolling areas, where a significant portion of the land is terraced. The frost-free growing season is about 210 days, with average freeze dates occurring in early to mid-April and early to mid-November. Both freeze dates occur as much as two weeks earlier in the extreme southern part of the Rolling Plains. Frost dates tend to be somewhat variable, but not to the same extent as on the High Plains. Cotton is normally planted during the last two weeks in May. While there is little problem in the area related to the growing season for cotton, the rainfall situation can be a major problem.

Rainfall, which is variable in the area, constitutes a major constraint on production since most of the area is not irrigated. Rainfall tends to increase from about 18 inches per year on the west side of the Rolling Plains to about 28 inches per year on the east side. The variation in rainfall is

a less critical factor on the east side. The rule-of-thumb is that annual rainfall increases by about two inches for each 50 miles one moves from west to east across the area. Summer temperatures here decrease less at night than in the High Plains. Wet weather in the fall sometimes hinders cotton and grain sorghum harvests.

A range of low mountains extends across parts of area A in the Northern Rolling Plains (across Greer, Kiowa, and Commanche counties, Oklahoma). North of this range the land flattens out and rainfall is slightly greater.

Soil types tend to be highly variable across the region, sometimes referred to as "marbled" soils. However, soils in the southern counties are generally clay loams with clay subsoils. There are some shallow soils with caliche outcroppings. The soils become loams and sandy loams further northward to about the Red River. Soils tend to be loams and clay loams with some sandy soils along the rivers in the northern (Oklahoma) counties.

Irrigation Water

There is comparatively little water available for irrigation in the Rolling Plains. The water available is mostly from groundwater sources. The annual supply of water for irrigation in the region amounts to about 650,000 to 700,000 acre feet (table 2). This amount is about 15 to 20 percent of the water available for irrigation in Fresno county, California, alone. Of the total, only about 16 percent is from surface sources which are scattered and isolated. Wichita county in Texas has surface water available from Lake Diversion which is fed from Lake Kent. Jackson county in Oklahoma has surface water from Lake Altus (appendix tables 7-10). The groundwater comes from relatively small, isolated underground aquifers scattered throughout the region. There is no large, continuous underground aquifer such as the Ogallala in the High Plains. Irrigation wells are powered by electricity and natural gas.

Table 2. Water used for irrigation in the Rolling Plains areas

Area	:	:	:	:		
	:	Surface water	:	Groundwater	:	Total
	:	:	:	:	:	:
----- 1,000 acre feet -----						
Northern A		49.1		219.0		268.1
Northern B		52.7		118.4		171.1
Southern A		24.3		188.9		213.2
Southern B		5.6		11.8		17.4
<hr/>						
Total		131.7		538.1		669.8
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Sources: (1) Oklahoma Water Resources Board. Reported Water Use in Oklahoma, 1974.
 (2) Texas Water Development Board. Inventories of Irrigation in Texas: 1958, 1964, 1969, and 1974, Research Report 196.

Area A in the Southern Rolling Plains has the heaviest concentration of irrigation; 11 percent of the harvested cropland was irrigated in 1974 compared with seven percent in area B in the Northern Plains, and three percent in the Southern Rolling Plains area B. However, the heaviest concentration of cotton irrigation is found in Northern area A where 11 percent of the harvested cotton acreage was irrigated in 1974 compared with eight percent in Southern A, and five percent each in Northern B and Southern B. The Northern Rolling Plains, particularly Northern B, tends to place priority use for irrigation water on alfalfa. Garza and Gray counties, which adjoin the High Plains, have the highest proportion of cropland irrigated with 44 percent of the harvested cropland irrigated in 1974. Knox and Dickens counties are the only other counties in the Rolling Plains with more than 25 percent of harvested cropland irrigated (27 and 26 percent respectively).

Production Practices and Problems

Most farms in the Rolling Plains are either owner-operated or owner-operated with additional land leased (appendix tables 11-17). The proportion of leased land tends to be higher in the extreme southern counties (from Nolan county, Texas, on to the south). The proportion of land leased in Oklahoma where some Oklahoma school land and Indian land are available for leasing is about 50 percent. Corporate farms, family or otherwise, are not common in the Rolling Plains; most farms utilize family labor with possibly one full-time hired worker on the larger farms (1,000 acres and over).

Leasing arrangements in the southern part of the Rolling Plains are typically share rent for field crops. Share-lease on cotton is one-fourth of gross receipts less one-fourth of the cost of chemicals, harvesting,

ginning, bagging and ties. Share-lease on grains is one-third of the gross receipts less one-third of the cost of fertilizer and harvesting. Pasture land is typically cash lease. In the northern part of the Rolling Plains, share leasing is the most common for cotton (one-fourth basis) but cash lease is predominant for wheat.

Many farmers in counties in the extreme southern part of the Rolling Plains are descendants of German or other ethnic backgrounds. These farmers are considered to be among the better managers in the area. Their farms, which are passed from generation to generation, reflect the skills and care of individual farmers in the use and conservation of resources

Farm size in the Texas portion of the Rolling Plains generally ranges from 600 to 1,800 acres with the typical size being about 1,280 acres. Farm sizes are smaller in Oklahoma. The average size is about 500 acres for all farms; 800 acres for the full-time farmers. Many farmers have interests in such businesses as grain elevators, fertilizer dealerships, cotton gins, and so forth. There tends to be somewhat more part-time farming in Oklahoma, but these farms usually are not considered commercial enterprises.

Insect Control

The primary insect problem throughout the Rolling Plains relates to the boll weevil. No intensive control is practiced because of the costs; the region is a low cost of production area and cotton producers tend to believe that intensive control practices would not be profitable. Less than 50 percent of the cotton acreage is sprayed at all for boll weevils. When spraying is done, the common practice is to use two early applications of methyl parathion (controls both weevils and fleahoppers), usually before the cotton has formed mature squares. Early plow-under of residue (immediately after cotton is harvested) is practiced in the far southern portion

of the area, but not elsewhere. The area has some occasional problem with early season thrips, but farmers do not employ control practices.

Cotton Diseases

Two different disease problems exist in the Rolling Plains. In the southern most counties, cotton root rot is a serious problem, especially on the heavier soils. The extent of the problem varies from year to year with temperature, humidity, rainfall, and so forth. In any given year some 25 to 30 percent of the land is affected; the problem is particularly noticeable every third year. The problem is most critical when the disease occurs early in the season. Control methods consist of (1) deep tillage (24 inches or more) and (2) rotation. The predominant rotation pattern is one year in cotton and one year in grain sorghum which tends to produce roughly equal acreages of cotton and grain sorghum. Farmers also prefer this rotation because of its diversification advantages. This area also has some problems with Fusarium wilt in the sandy soils; control consists of the use of wilt tolerant varieties. In the rest of the Rolling Plains, the diseases are Verticillium and Fusarium wilts in isolated areas. Control is primarily through resistant varieties, but it also includes rotation on a limited basis. When rotation is practiced, cotton land is rotated to a crop such as grain sorghum every third or fourth year. In much of the area cotton is a secondary crop at best and there is no opportunity to rotate with wheat (the major crop) because the growing seasons overlap. Also, dryland cotton is grown in skip-row patterns where rotation is not an important practice. Rotation is probably practiced as much to maintain yields as for any other reason.

Weed Control

A variety of annual weeds such as pigweed and Russian thistle causes problems in cotton production. These are usually controlled on cotton land with Treflan or Caparol along with three or four mechanical cultivations and some hand hoeing. Herbicides for annual weeds are applied in bands when planting grain sorghum. Perennial weeds are Johnsongrass, Purple Nightshade (fostered by the use of Treflan) and some bindweed. These are generally ignored in wheat land; severe infestations of these weeds may cause land to be put into wheat production. Johnsongrass in cotton is commonly spot sprayed with MSMA, DSMA, or Ansar. Mustard is a problem in wheat in parts of the northern part of the Rolling Plains; it is controlled with 2-4-D herbicide.

Irrigation Practices

Irrigation practices consist of both sprinkler and furrow methods. Furrow irrigation out of ditches is practiced almost exclusively in the far southern portion of the Rolling Plains but sprinkler irrigation and furrow irrigation with gated pipe become much more predominant in the lighter soils to the north. To the north of Fisher and Jones counties in Texas, irrigation is probably about half furrow and half sprinkler with wheat being predominantly furrow irrigated, and cotton and grain sorghum being either sprinkler irrigated or furrow irrigated from gated pipe. At least 90 percent of the sprinkler systems are side-roll or hand moved; only a small percentage is center-pivot. Side-roll systems are fast replacing the hand moved systems.

Fertilizer Use

Fertilizer is applied more on grain crops than on cotton. Since the Rolling Plains is predominantly a non-irrigated area, application of

fertilizer is a limited practice. More fertilizer is used on the sandier soils. When fertilizer is applied, the common treatment on grain sorghum and wheat is approximately 40 pounds of nitrogen with small amounts of phosphate. Fertilizer application rates on cotton, generally restricted to irrigated cotton only, range from 30 to 40 pounds of nitrogen.

Machinery Size

The size of equipment varies across the region. In the southern part of the Rolling Plains, there is a substantial amount of older tractors and equipment used on the smaller or non-commercial farms. On commercial row-crop farms, six-row equipment is typical but there is a rapid movement to eight-row equipment. Two-wheel drive tractors in the 100 to 150 horsepower range are most common. In the Northern Rolling Plains, the row-crop equipment is predominantly four-row with no noticeable movement to six-row machinery. In wheat production, however, equipment is much larger and generally more modern; four-wheel drive tractors are increasing, along with large equipment such as 33-foot wheat drills. The wheat land is prepared with disk plows; the use of mold board plows is rare.

Custom Operations

Equipment leasing is not practiced but custom operations are common throughout the area. Custom harvesting of grains is the predominant practice and custom harvesting of hay is almost universal. Because of a lack of storage facilities, grain from the far southern counties is usually trucked directly to Houston. Few feed lots are located in the Rolling Plains to utilize the grain. There is very little custom plowing. Cotton is generally harvested by the owner-operator except for some custom harvesting between neighbors. The latter is more predominant in the Northern Rolling Plains.

Except for some 5,000 to 6,000 acres of machine picked cotton in the southern portion of the Northern Rolling Plains, all cotton is machine stripped. Most insecticides are custom applied by plane. Ground applied insecticides are usually by the owner-operator. Herbicides tend to be custom applied in the Northern Rolling Plains and owner-operator applied in the Southern Rolling Plains. Both custom and owner-operator application of fertilizer is common, but custom application is more predominant in the Northern Rolling Plains.

Cotton Harvest

Almost all of the dryland cotton in the Rolling Plains is planted in skip-row patterns, predominantly a plant two, skip one pattern. Northern areas A and B are characteristically the last among all areas in the belt to complete cotton harvest. Lankart cotton predominates among cotton varieties grown in the Rolling Plains; although Lockett, Paymaster, and Tamcot are also common. Cotton ricking or moduling is not common in the region but may be gaining in importance as a practice in some scattered areas. In the far southern counties ginning capacity is sufficient to avoid long delays at the gin. There also is an abundant supply of large trailers in good condition. A few rickers and module builders are located in Nolan and Jones counties and northward, but ricks are more common than modules. In these areas, there is a half and half mix of older (three-bale) trailers and newer (five-bale) trailers. Producers using rickers are using them to avoid bottlenecks at the gin and continue stripping; they rick cotton when all their trailers are full. Average length of haul from farm to gin is about six miles; most hauls are under 15 miles with a maximum of about 40 miles. Trailers are typically pulled with pickups.

Competing Crops

In Southern A, cotton competes with grain sorghum for the level, fertile land while wheat is typically grown on the rolling, less fertile soils. The competition is limited, however, by the rotation pattern followed. Cotton is a secondary crop in the remainder of the region, and competes only to a small degree even with grain sorghum and various minor crops. For these reasons, cotton acreages throughout the region will likely remain reasonably stable, except for shifts on account of climatic factors, or continue its gradual decline (particularly in Northern areas A and B). Even though production costs are low and the cotton quality high relative to the High Plains, the cotton acreage in Oklahoma declined from 1.5 million acres in 1944 to 350,000 acres in 1976. Insect problems influenced the decline in cotton acreage in eastern Oklahoma; the major current factors seem to be the relative ease, cost, and less management associated with producing wheat, and the complementarity of wheat with the livestock industry.

Summary

The Rolling Plains is largely a dryland farming area where cotton and grains are the dominant crops. Irrigation is limited in the area because of the relatively small and isolated water sources scattered throughout the region. The heaviest concentration of irrigation is in area B of the southern part of the region where the coverage amounted to about 11 percent of the harvested cropland in 1974. Less than five percent of the acreage was irrigated in other parts of the region.

The area is characterized by large farms generally ranging from 600 to 1,800 acres, a variety of land capability situations, rolling terrain, limited rainfall, and wide differences in production possibilities. Most

farms in the Rolling Plains are either owner operator or part-owner operations where family labor is a key factor in the farming operation.

The emphasis on holding down production costs and the extensive character of farming in the region influence production decisions with respect to the level and mix of inputs. For example, insect control is a primary problem in the region, but farmers do not generally emphasize intensive control practices on account of the added cost. There also is a tendency to hold down the use of fertilizer and other chemicals or to substitute other crops, principally wheat, for cotton in the farm organization in efforts to reduce production costs and improve farm income. Further changes in input mix and enterprise combinations may occur in the region in the years ahead as a result of the continuing push by producers to cope with increasing production costs and inflationary pressures.

Appendix Table 1. Cropland utilization in Northern Rolling Plains A, 1974

State and County	Cotton	Alfalfa	Cropland harvested (1,000 acres)					Total
			Total	Grains	(Wheat)	Vegetables	Other	
				(Sorghum)				
Oklahoma								
Beckham	54.2	8.7	95.6	(20.9)	(70.9)	0	14.7	173.2
Greer	36.5	14.5	93.6	(3.3)	(86.5)	0	12.1	156.7
Harmon	38.0	2.8	86.3	(10.2)	(73.8)	0	8.2	135.3
Jackson	62.3	7.5	185.8	(5.1)	(178.0)	0	10.1	265.7
Kiowa	62.5	10.2	254.7	(6.5)	(244.0)	0	13.8	341.2
Tillman	75.0	16.9	261.8	(4.4)	(249.0)	0	7.4	361.1
Washita	81.4	12.6	244.7	(16.5)	(220.0)	0	20.4	359.1
Sub-total	409.9	73.2	1,222.5	(66.9)	(1,122.2)	0	86.7	1,792.3
Texas								
Childress	46.9	.5	44.5	(4.0)	(40.1)	0	3.7	95.3
Collingsworth	54.5	2.4	64.1	(26.1)	(36.8)	0	6.9	127.9
Donley	23.4	2.1	32.0	(11.1)	(19.3)	.1	7.4	65.0
Foard	13.8	1.6	93.9	(1.7)	(92.1)	0	2.5	111.8
Gray	1.7	2.6	94.2	(32.2)	(60.8)	0	6.7	105.2
Hardeman	26.6	2.8	101.9	(1.4)	(99.2)	.1	11.9	143.3
Wheeler	15.6	6.3	50.6	(13.5)	(35.7)	.1	10.5	83.1
Wilbarger	54.5	11.8	86.6	(2.7)	(79.4)	.3	18.2	171.4
Sub-total	237.0	30.1	567.5	(92.7)	(463.4)	.6	67.8	903.0
Total	646.9	103.3	1,790.0	(159.6)	(1,585.6)	.6	154.5	2,695.3

Sources: Cited, table 1.

Appendix Table 2. Cropland utilization in Northern Rolling Plains B, 1974

State and County	Cropland harvested (1,000 acres)							
	Cotton	Alfalfa	Total	Grains (Sorghum)	(Wheat)	Vegetables	Other	Total
Oklahoma								
Blaine	3.8	14.0	220.9	(5.3)	(207.0)	0	9.2	247.9
Caddo	37.2	22.4	193.6	(22.1)	(162.0)	.6	57.1	310.9
Canadian	7.5	17.9	239.2	(4.6)	(214.0)	0	23.2	287.8
Comanche	4.8	7.3	81.9	(2.7)	(72.7)	0	17.4	111.4
Cotton	5.4	4.1	156.9	(1.7)	(151.0)	0	5.6	172.0
Custer	17.7	7.0	244.7	(6.6)	(230.0)	.1	13.9	283.4
Dewey	2.9	5.4	147.0	(2.6)	(137.0)	0	10.3	165.6
Garvin	2.0	25.0	24.2	(5.3)	(11.2)	0	19.9	71.1
Grady	14.4	20.3	104.8	(11.0)	(80.3)	0	19.9	159.4
Jefferson	5.3	1.3	35.6	(1.6)	(30.6)	0	7.1	49.3
McClain	6.3	15.4	25.1	(4.1)	(17.4)	0	25.0	71.8
Roger Mills	10.4	8.7	87.2	(11.3)	(69.1)	0	12.8	119.1
Stephens	3.1	5.2	39.9	(2.4)	(33.2)	0	21.8	70.0
Sub-total	120.8	154.0	1,601.0	(81.3)	(1,415.5)	.7	243.2	2,119.7
Texas								
Clay	3.7	3.7	50.1	(2.7)	(45.0)	.1	9.2	66.8
Wichita	4.9	1.3	60.0	(.3)	(55.5)	0	8.5	74.7
Sub-total	8.6	5.0	110.1	(3.0)	(100.5)	.1	17.7	141.5
Total	129.4	159.0	1,711.1	(84.3)	(1,516.0)	.8	260.9	2,261.2

Sources: Cited, table 1.

Appendix Table 3. Cropland utilization in Southern Rolling Plains A, 1974

County	Cropland harvested (1,000 acres)					
	Cotton	Alfalfa	Total	Grains : (Sorghum)	Vegetables : (Wheat)	Total
Borden	6.3	0	1.8	(1.4)	(.4)	2.2
Coke	.5	0	5.2	(4.2)	(.7)	6.6
Concho	15.9	0	35.3	(17.8)	(15.1)	15.8
Cottle	52.1	.5	17.7	(4.9)	(9.4)	5.5
Dickens	13.0	.8	18.1	(14.4)	(3.6)	3.2
Fisher	54.0	.6	26.3	(7.5)	(18.1)	11.2
Garza	16.1	0	3.1	(2.8)	(.3)	3.5
Hall	101.1	3.7	11.2	(7.4)	(3.0)	6.1
Haskell	108.8	.7	69.0	(30.2)	(35.8)	16.3
Jones	38.0	.1	87.0	(34.2)	(41.1)	13.3
Kent	11.8	.7	2.4	(1.7)	(.7)	6.1
King	10.2	0	1.6	(.9)	(.7)	.6
Knox	43.2	.8	104.6	(26.0)	(77.4)	12.1
Mitchell	43.0	.5	6.5	(5.9)	(.5)	8.2
Motley	39.2	.7	9.8	(5.7)	(3.8)	9.2
Nolan	22.8	.2	12.9	(7.6)	(5.0)	9.1
Runnels	42.0	0	92.6	(64.4)	(24.1)	10.7
Schleicher	5.3	0	3.9	(5.0)	(0)	10.2
Scurry	40.3	.5	9.1	(8.2)	(.9)	6.2
Stonewall	11.4	0	14.2	(2.9)	(9.1)	6.5
Tom Green	49.3	.6	58.1	(57.7)	(0)	6.4
Total	724.3	10.4	585.4	(310.8)	(249.7)	169.0
					2.3	1,491.4

Sources: Cited, table 1.

Appendix Table 4. Cropland utilization in Southern Rolling Plains B, 1974

Crop	Archer	Baylor	Callahan	Coleman	McCulloch	Shackelford	Taylor	Throckmorton	Young	Total
Cotton	1.2	11.7	.7	8.7	4.6	2.2	10.1	6.4	4.8	50.4
Alfalfa	0	.2	0	0	0	0	.1	0	0	.3
Grains	46.2	63.8	31.7	43.2	33.9	23.9	61.5	44.6	65.4	414.2
(Sorghum)	(.5)	(2.3)	(5.9)	(21.9)	(14.3)	(2.5)	(18.9)	(2.8)	(2.9)	(72.0)
(Wheat)	(44.5)	(59.1)	(24.4)	(21.3)	(14.7)	(18.9)	(37.6)	(41.3)	(57.9)	(319.7)
Vegetables	0	0	0	0	.2	0	0	0	0	.2
Other	5.1	4.7	9.7	130.0	16.2	2.3	14.0	10.2	5.2	197.4
Total	52.5	80.4	42.1	181.9	54.9	28.4	85.7	61.2	75.4	662.5

Sources: Cited, table 1.

Appendix Table 5. Cotton acreage, production, and yield per acre in the Northern Rolling Plains, 1947-74

Year	Acres planted	Acres harvested	Bales produced	Pounds of lint per acre
1947	1,204,330	1,183,370	351,990	142
1948	1,093,000	984,970	411,270	200
1949	1,390,198	1,359,144	745,860	263
1950	972,159	892,107	306,541	164
1951	1,872,100	1,776,500	535,910	144
1952	1,623,600	1,516,200	291,620	92
1953	1,236,700	1,156,130	445,340	184
1954	1,139,330	1,089,510	340,580	150
1955	953,740	917,700	503,770	263
1956	933,250	840,100	303,980	173
1957	764,820	723,780	337,510	223
1958	604,890	563,820	395,870	337
1959	815,970	760,560	450,990	284
1960	822,210	783,690	552,980	338
1961	889,600	817,200	488,470	286
1962	872,430	798,950	395,365	237
1963	798,120	753,950	418,810	266
1964	786,830	734,480	359,070	234
1965	749,880	710,870	444,840	300
1966	559,840	484,930	272,770	269
1967	534,230	470,040	266,470	272
1968	563,150	519,230	371,350	343
1969	651,540	609,620	339,360	267
1970	669,330	571,580	235,625	197
1971	590,050	518,400	233,995	216
1972	736,410	671,350	457,867	327
1973	755,210	732,200	608,916	399
1974	802,900	776,180	413,465	255

Average yield 1947 - 1956 ---- 178.1 pounds
 Average yield 1956 - 1965 ---- 268.4 do.
 Average yield 1965 - 1974 ---- 285.0 do.

Source: Statistical Reporting Service, USDA.

Appendix Table 6. Cotton acreage, production, and yield per acre in the Southern Rolling Plains, 1947-74

Year	Acres planted	Acres harvested	Bales produced	Pounds of lint per acre
1947	1,361,570	1,345,870	415,895	148
1948	1,439,860	1,382,040	392,115	136
1949	1,903,452	1,892,402	943,674	239
1950	1,172,500	1,117,210	518,073	222
1951	2,309,099	2,090,750	401,750	92
1952	2,178,910	1,533,740	167,308	52
1953	1,589,160	1,426,600	365,770	123
1954	1,451,860	1,367,950	328,140	115
1955	1,311,070	1,233,100	435,210	169
1956	1,129,300	804,940	200,600	119
1957	972,960	909,860	404,290	213
1958	872,300	827,160	464,490	269
1959	1,171,540	1,087,200	534,670	236
1960	1,150,080	1,060,950	649,490	293
1961	1,263,750	1,159,100	725,570	300
1962	1,210,500	1,126,670	523,435	223
1963	1,084,230	1,016,590	538,445	254
1964	1,074,760	948,430	406,460	205
1965	1,019,190	971,000	620,100	306
1966	769,710	709,010	459,970	311
1967	709,250	629,590	386,135	294
1968	783,800	747,150	635,315	408
1969	947,950	872,300	366,335	201
1970	936,320	873,900	477,320	262
1971	962,200	839,150	365,074	208
1972	1,020,475	901,500	714,075	380
1973	986,420	947,600	810,470	410
1974	916,500	774,545	299,135	185
Average Yield 1947 - 1956 ----				141.8 pounds
Average Yield 1956 - 1965 ----				242.2 do.
Average Yield 1965 - 1974 ----				296.9 do.

Source: Statistical Reporting Service, USDA.

Appendix Table 7. Water used for irrigation, Northern Rolling Plains A, 1974

State and county	Surface water	Groundwater	Total
----- 1,000 acre feet -----			
Oklahoma			
Beckham	.8	6.3	7.1
Greer	.4	8.9	9.3
Harmon	.1	18.1	18.2
Jackson	36.3	9.9	46.2
Kiowa	1.5	4.4	5.9
Tillman	2.5	17.8	20.3
Washita	<u>5.1</u>	<u>8.6</u>	<u>13.7</u>
Sub-total	46.7	74.0	120.7
Texas			
Childress		9.4	9.4
Collingsworth	.2	17.4	17.6
Donley		26.0	26.0
Foard		3.5	3.5
Gray		45.7	45.7
Hardeman	.2	17.2	17.4
Wheeler	.3	10.1	10.4
Wilburger	<u>1.7</u>	<u>15.7</u>	<u>17.4</u>
Sub-total	2.4	145.0	147.4
Total	49.1	219.0	268.1

Sources: Cited, table 2.

Appendix Table 8. Water used for irrigation, Northern Rolling Plains B, 1974

State and county	Surface water	Groundwater	Total
	----- 1,000 acre feet -----		
Oklahoma			
Blaine	.4	3.3	3.7
Caddo	5.8	60.0	65.8
Canadian	.2	23.4	23.6
Comanche	1.2	1.0	2.2
Cotton	2.8	.6	3.4
Custer	2.1	7.4	9.5
Dewey		3.6	3.6
Garvin	1.7	2.6	4.3
Grady	4.1	2.3	6.4
Jefferson	.6	.1	.7
McClain	1.6	3.4	5.0
Roger Mills	2.2	9.9	12.1
Stephens	<u>1.0</u>	<u>.3</u>	<u>1.3</u>
Sub-total	23.7	117.9	141.6
Texas			
Clay	.2	.3	.5
Wichita	<u>28.8</u>	<u>.2</u>	<u>29.0</u>
Sub-total	29.0	.5	29.5
Total	52.7	118.4	171.1

Sources: Cited, table 2.

Appendix Table 9. Water used for irrigation, Southern Rolling Plains A, 1974

County	Surface water	Groundwater	Total
	----- 1,000 acre feet -----		
Borden		.6	.6
Coke		.8	.8
Concho	.2	.5	.7
Cottle		4.7	4.7
Dickens	.3	15.0	15.3
Fisher	.7	2.1	2.8
Garza		15.7	15.7
Hall		25.2	25.2
Haskell	.1	41.6	41.7
Jones	1.2	3.1	4.3
Kent		2.1	2.1
King	.1	.5	.6
Knox	.3	44.7	45.0
Mitchell	.2	4.2	4.4
Motley	.1	6.5	6.6
Nolan	.2	2.7	2.9
Runnels	6.6	1.2	7.8
Schleicher		2.0	2.0
Scurry		5.9	5.9
Stonewall	.1	.6	.7
Tom Green	14.2	9.2	23.4
Total	24.3	188.9	213.2

Sources: Cited, table 2.

Appendix Table 10. Water used for irrigation, Southern Rolling Plains B, 1974

County	Surface water	Groundwater	Total
	----- 1,000 acre feet -----		
Archer	.8		.8
Baylor	.3	5.4	5.7
Callahan	.8	1.0	1.8
Coleman	2.8		2.8
McCulloch	.4	1.8	2.2
Shackelford	.3	.1	.4
Taylor	.1	3.3	3.4
Throckmorton			
Young	.1	.2	.3
Total	5.6	11.8	17.4

Sources: Cited, table 2.

Appendix Table 11. Selected characteristics of farms with sales of at least \$2,500 in 1974, Rolling Plains

Item	Farms reporting	Average per farm	Average per farm	Acreage irrigated	Acreage fertilized	Yield per acre
	Percent	Acre	Acre	Percent	Percent	
Total number farms - 31,284						
Total acres - 30.6 million						
Total land (acres)	100	977	977	1	11	
Cropland	91	335	368	4		
Cotton	39	50	126	9	30	0.5 bl.
Wheat	57	116	203	2	56	20 bu.
Barley	3	1	40	2	53	46 bu.
Sorghum	25	24	98	4	27	<u>1</u> /24 bu.
Hay	34	15	43	12	29	1.9 tons
Vegetables	1	0	21	22	71	
Orchards	1	0	23	4	24	
Irrigated land	11	13	116	100		
Furrows or ditches	4	6	140			
Sprinkler systems	7	6	87			
Irrigated cropland	11	13	117	100		
Land fertilized	49	103	209		100	
Row crop insecticides	8	16	194			
Crop herbicides	14	29	205			
Defoliantes	3	4	118			
Ownership:						
Full owners	42	310	745			
Part owners	41	528	1,292			
Tenants	18	138	789			
Size:						
100-499	46					
500-1,999 acres	37					
2,000 acres and over	8					
Operator age 65 and over	22					
Operators working off-farm	21					
200 days and over						
			Number			
Wheel tractors	79	1.7	2.1			
1970 or newer		0.4	0.5			
Crawler tractors	3	0.0	1.2			
Acre ft. irrigation						
water applied per acre			1.1			

1/ Harvested for grain.

Source: Bureau of the Census, U.S. Dept. of Commerce, 1974 Census of Agriculture.

Appendix Table 12. Selected characteristics of farms with sales of at least \$2,500 in 1974, Northern Rolling Plains A

Item	Farms reporting	Average per farm	Average per farm	Acreage irrigated	Acreage fertilized	Yield per acre
	Percent	Acre	Acre	Percent	Percent	
Total number farms - 8,431						
Total acres - 7.4 million						
Total land (acres)	100	874	874	2	15	
Cropland	91	387	423	5		
Cotton	61	64	105	13	49	0.6 bl.
Wheat	74	180	242	2	43	18 bu.
Barley	2	1	42	5	35	23 bu.
Sorghum	22	20	90	13	47	<u>1</u> /28 bu.
Hay	34	14	42	18	40	2.0 tons
Vegetables	1	0	8	40	58	
Orchards	1	0	10	1	6	
Irrigated land	15	19	131	100		
Furrows or ditches	7	11	150			
Sprinkler systems	8	7	89			
Irrigated cropland	14	19	137	100		
Land fertilized	55	131	239		100	
Row crop insecticides	11	22	193			
Crop herbicides	15	27	178			
Defoliantes	3	3	80			
Ownership:						
Full owners	40	226	568			
Part owners	42	538	1,273			
Tenants	18	110	612			
Size:						
100-499	46					
500-1,999 acres	39					
2,000 acres and over	7					
Operator age 65 and over	23					
Operators working off-farm	18					
200 days and over			Number			
Wheel tractors	80	1.8	2.2			
1970 or newer		0.4	0.6			
Crawler tractors	2	0.0	1.2			
Acre ft. irrigation			1.2			
water applied per acre						

1/ Harvested for grain.

Source: Bureau of the Census, U.S. Dept. of Commerce, 1974 Census of Agriculture.

Appendix Table 13. Selected characteristics of farms with sales of at least \$2,500 in 1974, Northern Rolling Plains B

Item	Farms reporting	Average per farm	Average per farm	Acreage irrigated	Acreage fertilized	Yield per acre
	Percent	Acre	Acre	Percent	Percent	
Total number farms - 11,414						
Total acres - 7.0 million						
Total land (acres)	100	615	615	1	23	
Cropland	91	264	290	3		
Cotton	19	11	57	7	61	0.7 bl.
Wheat	67	131	196	1	78	24 bu.
Barley	5	2	40	1	65	61 bu.
Sorghum	17	8	49	10	57	<u>1</u> /38 bu.
Hay	45	19	44	8	31	2.2 tons
Vegetables	1	0	28	14	72	
Orchards	2	1	34	0	28	
Irrigated land	8	8	93	100		
Furrows or ditches	1	1	100			
Sprinkler systems	7	6	87			
Irrigated cropland	8	8	91	100		
Land fertilized	69	140	204		100	
Row crop insecticides	5	8	144			
Crop herbicides	10	12	127			
Defoliants	1	1	69			
Ownership:						
Full owners	42	178	419			
Part owners	42	368	874			
Tenants	15	69	448			
Size:						
100-499	52					
500-1,999 acres	33					
2,000 acres and over	4					
Operator age 65 and over	21					
Operators working off-farm						
200 days and over	24					
		Number				
Wheel tractors	80	1.5	1.9			
1970 or newer		0.4	0.5			
Crawler tractors	3	0.0	1.1			
Acre ft. irrigation water applied per acre			1.1			

1/ Harvested for grain.

Source: Bureau of the Census, U.S. Dept. of Commerce, 1974 Census of Agriculture.

Appendix Table 14. Selected characteristics of farms with sales of at least \$2,500 in 1974, Southern Rolling Plains A

Item	Farms reporting	Average per farm	Average per farm reporting	Acreage irrigated	Acreage fertilized	Yield per acre
	Percent	Acre	Acre	Percent	Percent	
Total number farms - 7,696						
Total acres - 11.5 million						
Total land (acres)	100	1,490	1,490	1	3	
Cropland	92	405	443	4		
Cotton	58	108	188	7	15	0.4 bl.
Wheat	26	38	148	4	25	12 bu.
Barley	1	0	32	11	29	18 bu.
Sorghum	41	55	134	7	14	<u>1</u> /17 bu.
Hay	21	10	45	14	10	1.4 tons
Vegetables	0	0	17	61	74	
Orchards	1	0	13	27	19	
Irrigated land	15	17	117	100		
Furrows or ditches	7	9	134			
Sprinkler systems	8	7	84			
Irrigated cropland	14	17	118	100		
Land fertilized	22	39	177		100	
Row crop insecticides	11	25	239			
Crop herbicides	23	64	282			
Defoliantes	7	10	149			
Ownership:						
Full owners	40	542	1,358			
Part owners	40	720	1,806			
Tenants	21	232	1,119			
Size:						
100-499	39					
500-1,999 acres	40					
2,000 acres and over	13					
Operator age 65 and over	21					
Operators working off-farm						
200 days and over	17					
		Number				
Wheel tractors	80	1.8	2.3			
1970 or newer		0.5	0.6			
Crawler tractors	3	0.0	1.6			
Acre ft. irrigation						
water applied per acre			1.1			

1/ Harvested for grain.

Source: Bureau of the Census, U.S. Dept. of Commerce, 1974 Census of Agriculture.

Appendix Table 15. Selected characteristics of farms with sales of at least \$2,500 in 1974, Southern Rolling Plains B

Item	Farms reporting	Average per farm	Average per farm	Acreage irrigated	Acreage fertilized	Yield per acre
	Percent	Acre	Acre	Percent	Percent	
Total number farms - 3,743						
Total acres - 4.7 million						
Total land (acres)	100	1,257	1,257	1	5	
Cropland	89	287	322	2		
Cotton	15	15	98	2	13	0.3 bl.
Wheat	53	86	189	1	46	14 bu.
Barley	2	1	49	0	35	20 bu.
Sorghum	22	21	93	3	18	<u>1</u> /16 bu.
Hay	27	12	45	9	20	1.1 tons
Vegetables	0	0	10	47	88	
Orchards	2	50	23	2	22	
Irrigated land	5	6	128	100		
Furrows or ditches	1	2	141			
Sprinkler systems	4	4	100			
Irrigated cropland	5	5	109	100		
Land fertilized	35	61	173		100	
Row crop insecticides	4	7	161			
Crop herbicides	6	9	148			
Defoliantes	1	1	87			
Ownership:						
Full owners	47	427	907			
Part owners	37	611	1,663			
Tenants	16	219	1,352			
Size:						
100-499	42					
500-1,999 acres	37					
2,000 acres and over	13					
Operator age 65 and over	27					
Operators working off-farm						
200 days and over	27					
		Number				
Wheel tractors	75	1.4	1.8			
1970 or newer		0.3	0.4			
Crawler tractors	4	0.0	1.2			
Acre ft. irrigation						
water applied per acre			0.9			

1/ Harvested for grain.

Source: Bureau of the Census, U.S. Dept. of Commerce, 1974 Census of Agriculture.

Appendix Table 16. Selected characteristics of farms with sales of at least \$2,500 in 1969, Northern Rolling Plains

Item	Farms reporting	Average per farm	Average per farm reporting	Acreage irrigated	Acreage fertilized	Yield per acre
	Percent	Acre	Acre	Percent	Percent	
Total number farms - 21,670						
Total acres - 14.9 million						
Total land (acres)	100	687	687	2	14	
Cropland	93	310	333	4		
Cotton	46	28	61	12	44	0.6 bl.
Wheat	65	96	147	2	50	25 bu.
Barley	15	11	71	1	58	35 bu.
Sorghum	24	15	63	14	57	<u>1</u> /35 bu.
Hay	45	21	45	11	25	2.3 tons
Vegetables	1	0	19	17	70	
Orchards	3	1	20	4	32	
Irrigated land	12	13	105	100		
Furrows or ditches						
Sprinkler systems						
Irrigated cropland	12	13	103	100		
Land fertilized	58	98	171		100	
Row crop insecticides	14	21	149			
Crop herbicides	15	13	88			
Defoliantes	3	2	55			
Ownership:						
Full owners	38	175	467			
Part owners	43	413	952			
Tenants	19	99	516			
Size:						
100-499	53					
500-1,999 acres	36					
2,000 acres and over	4					
Operator age 65 and over	17					
Operators working off-farm						
200 days and over	23					
		Number				
Wheel tractors	86	1.7	1.9			
1965 or newer		0.6	0.7			
Crawler tractors	3	0.0	1.2			
Acre ft. irrigation						
water applied per acre		NA	NA			

1/ Harvested for grain.

Source: Bureau of the Census, U.S. Dept. of Commerce, 1974 Census of Agriculture.

Appendix Table 17. Selected characteristics of farms with sales of at least \$2,500 in 1969, Southern Rolling Plains

Item	Farms reporting	Average per farm	Average per farm reporting	Acreage irrigated	Acreage fertilized	Yield per acre
	Percent	Acre	Acre	Percent	Percent	
Total number farms - 13,389						
Total acres - 17.0 million						
Total land (acres)	100	1,273	1,273	1	3	
Cropland	92	337	365	4		
Cotton	59	73	123	9	15	0.4 bl.
Wheat	40	41	104	1	22	19 bu.
Barley	3	2	52	3	26	28 bu.
Sorghum	44	44	99	7	12	<u>1</u> /25 bu.
Hay	25	10	39	9	13	1.5 tons
Vegetables	1	0	18	11	18	
Orchards	2	0	11	13	34	
Irrigated land	12	13	109	100		
Furrows or ditches						
Sprinkler systems						
Irrigated cropland	12	13	109	100		
Land fertilized	24	33	140		100	
Row crop insecticides	10	14	148			
Crop herbicides	19	29	152			
Defoliantes	10	12	119			
Ownership:						
Full owners	38	373	970			
Part owners	39	687	1,766			
Tenants	23	214	942			
Size:						
100-499	45					
500-1,999 acres	38					
2,000 acres and over	11					
Operator age 65 and over	20					
Operators working off-farm						
200 days and over	21					
		Number				
Wheel tractors	85	1.7	2.0			
1965 or newer		0.7	0.8			
Crawler tractors	3	0.0	1.3			
Acre ft. irrigation						
water applied per acre		NA	NA			

1/ Harvested for grain.

Source: Bureau of the Census, U.S. Dept. of Commerce, 1974 Census of Agriculture.

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